

Listing of the Claims

The current listing of the claims replaces all previous amendments and listings of the claims.

1. (Previously Presented) A ceramic heater system comprising:
a heater base integrally formed of a ceramic material,
the heater base comprising:
a mounting surface formed as an upper surface of the heater base and configured to receive an object thereon,
a heater disposed in said heater base and configured to heat the object, and
a gas passage provided in said heater base below said heater, said gas passage formed in a lower surface of the heater base and comprising a gas inlet and gas outlets configured to feed a gas into and out from the gas passage, the gas passage comprising a plurality of first passages disposed concentrically in the heater base and a plurality of second passages connecting the plurality of first passages without being aligned in a direction towards a center of concentricity of the plurality of first passages,
wherein said heater base is configured to be cooled by feeding the gas having a temperature lower than a temperature of said heater base to the gas passage.
2. and 3. (Canceled)
4. (Previously Presented) The ceramic heater system according to claim 1, wherein the gas inlet is formed in a central portion of a lower surface of said heater base, and the gas outlets are formed in outer circumference portions of the lower surface of said heater base.
5. (Previously Presented) The ceramic heater system according to claim 1, wherein the gas comprises at least one of Ar, He, Ne and N₂ gases.
6. (Previously Presented) The ceramic heater system according to claim 1, wherein said gas comprises Ar and He.

7.-8. (Canceled)

9. (Previously Presented) The ceramic heater system according to claim 1, wherein said heater has a high-melting-point metal patterned in a coil form to evenly generate heat in said heater base.

10. (Previously Presented) The ceramic heater system according to claim 1, wherein said heater comprises one of graphite and glassy carbon shaped in a pattern to evenly generate heat in said heater base.

11. (Previously Presented) The ceramic heater system according to claim 10, wherein said heater comprises one of glassy boron nitride coated on an outer surface of graphite and glassy carbon.

12. (Previously Presented) The ceramic heater system according to claim 1, further comprising:

an electrode disposed in said heater base and located between the heater and the mounting surface; and

power supply means for applying a direct current voltage to said electrode,

wherein an electrostatic chuck is configured to be formed when the voltage is applied to the electrode, the electrostatic chuck configured to one of electrostatically attract and detach the object mounted on the heater base, and the electrostatic chuck and the heater form a one-body structure.

13.-16. (Canceled)

17. (Previously Presented) The ceramic heater system according to claim 1, wherein the gas inlet is formed in a central portion of a lower surface of said heater base, and the gas outlets are formed through circumferential side walls of said heater base.

18. (Previously Presented) A ceramic heater system comprising:
an upper heater base integrally formed of a ceramic material; and

a lower heater base formed of a ceramic material, the upper heater base and the lower heater base forming a one-body heater base, with a lower surface of the upper heater base contacting the lower heater base,

the one-body heater base comprising:

a mounting surface formed as an upper surface of the upper heater base and configured to receive an object thereon,

a heater disposed in said upper heater base and configured to heat the object, and

a gas passage provided below the heater and formed on the upper heater base and the lower heater base, the gas passage formed in a lower surface of the lower heater and comprising a gas inlet and gas outlets configured to feed a gas into and out from the gas passage, the gas passage comprising a plurality of first passages disposed concentrically in the lower heater base and a plurality of second passages connecting the plurality of first passages without being aligned in a direction toward a center of concentricity of the plurality of first passages,

wherein said upper and lower heater bases are configured to be cooled by feeding the gas having a temperature lower than a temperature of the upper heater base to the gas passage.

19. (Previously Presented) A processing apparatus comprising:

a chamber defining an interior configured to achieve a vacuum state by an exhaust system;

a ceramic heater system disposed in the chamber and configured to heat an object; and processing means for performing a predetermined treatment on a substrate in said chamber,

said ceramic heater system comprising,

a heater base integrally formed of a ceramic material,

a mounting surface formed as an upper surface of the heater base and configured to receive the object thereon,

a heater disposed in said heater base and configured to heat said object, and

a gas passage provided in said heater base below said heater, the gas passage formed in a lower surface of the heater base and comprising a gas inlet and gas outlets configured to feed a gas into and out from the gas passage, the gas passage comprising a plurality of first passages disposed concentrically in the heater base and a plurality of second passages connecting the plurality of first passages without being aligned in a direction towards a center of concentricity of the plurality of first passages,

wherein said heater base is configured to be cooled by feeding the gas having a temperature lower than a temperature of said heater base to the gas passage.

20. (Previously Presented) The processing apparatus according to claim 19, wherein said processing means comprises:

a process-gas supply mechanism configured to feed a process gas; and

a shower head disposed in said chamber at a ceiling thereof and configured to introduce said process gas from said process-gas supply mechanism to form a film on the substrate by a reaction of the process gas.

21. (Previously Presented) The processing apparatus according to claim 19, further comprising:

a high-frequency power supply connected to said shower head and configured to electrically isolate said shower head and apply high-frequency power to said shower head;
and

a lower electrode embedded in the heater base and located between an upper surface of the heater base and the heater,

wherein the shower head is configured such that plasma is generated by applying the high-frequency power to the shower head in the chamber which is in a gaseous atmosphere supplied with the process gas from the shower head, and a film is formed on the object by a reaction of the process gas with the plasma.

22. (Previously Presented) The processing apparatus according to claim 19, wherein said processing means comprises:

- a gas feeding mechanism configured to feed an etching gas,
- an electrically isolated shower head disposed in said chamber at a ceiling thereof and configured to introduce a process gas from said gas feeding mechanism,
- a high-frequency power supply connected to said shower head and configured to apply high-frequency power to said shower head, and
- a lower electrode embedded in the heater base and located between the heater base and the heater,

wherein the shower head and the lower electrode are configured such that, when the high-frequency power is applied to the shower head and/or the lower electrode in a chamber atmosphere into which the etching gas is supplied from the shower head, plasma is generated and a surface of the object is etched by a reaction of the etching gas.

23.-25. (Canceled)

26. (Previously Presented) The ceramic heater system according to claim 1, wherein the ceramic material comprises at least one of a nitride-based metallic material having a high melting point and an oxide-based metallic material having a high melting point.

27. (Previously Presented) The ceramic heater system according to claim 26, wherein the nitride-based metallic material comprises AlN.

28. and 29. (Canceled)

30. (Previously Presented) The ceramic heater system according to claim 18, wherein the gas inlet is formed in a central portion of a lower surface of the heater base, and the gas outlets are formed in outer circumference portions of the lower surface of the heater base.

31. (Previously Presented) The ceramic heater system according to claim 18, wherein the gas comprises at least one of Ar, He, Ne and N₂.

32. (Previously Presented) The ceramic heater system according to claim 31, wherein the gas comprises Ar and He.

33.-35. (Canceled)

36. (Previously Presented) The ceramic heater system according to claim 18, wherein the heater comprises a winding including of a high-melting point metallic material and having a pattern to uniformly heat an internal region of the heater base.

37. (Previously Presented) The ceramic heater system according to claim 18, wherein the heater comprises one of graphite and vitreous carbon and has a pattern to uniformly heat an internal region of the heater base.

38. (Previously Presented) The ceramic heater system according to claim 37, wherein the heater comprises vitreous boron nitride over outer surfaces of at least one of graphite and glass carbon.

39. (Previously Presented) The ceramic heater system according to claim 19, further comprising:

an electrode disposed in the heater base and located between the heater and the mounting surface, and

power supply means for applying a voltage to the electrode,

wherein, an electrostatic chuck is configured to be formed when the voltage is applied to the electrode, the electrostatic chuck configured to one of electrostatically attract and

detach the object mounted on the heater base, the electrostatic chuck and the heater forming a one-body structure.

40. (Previously Presented) The ceramic heater system according to claim 18, further comprising:

a gas supply source configured to output the gas to be supplied through the gas passage;

a temperature control unit configured to control the gas from the gas supply source such that the gas has a temperature within a predetermined range, and to supply the gas into the gas passage; and

a heat exchanger configured to remove heat provided by the heater base from the gas, wherein the gas supply source, the temperature control unit, the fluid passage and the heat exchanger are configured to simultaneously circulate and control the temperature of the gas.

41. (Previously Presented) The ceramic heater system according to claim 18, wherein the gas passage has an internal surface area configured to provide a predetermined heating/cooling efficiency.

42. (Previously Presented) The ceramic heater system according to claim 41, wherein the gas passage comprises a heat-radiation fin disposed on a heater side and a roughened inner surface disposed on the heater side.

43. (Canceled)

44. (Previously Presented) The ceramic heater system according to claim 18, wherein the upper heater base and the lower heater base are coupled together by use of at least one of a ceramic adhesive ~~or~~ and a screw.

45.-55. (Canceled)

56. (Previously Presented) A ceramic heater system comprising:

a heater base integrally formed of a ceramic material,
the heater base comprising:

a mounting surface formed as an upper surface of the heater base and configured to receive an object thereon;

a heater configured to heat the object, the heater disposed in said heater base and having a high-melting-point metal patterned in a coil form to evenly generate heat in the heater base; and

a gas passage provided in said heater base below said heater, the gas passage formed in a lower surface of the heater base and comprising a gas inlet and gas outlets configured to feed a gas into and out from the gas passage, the gas passage comprising a plurality of first passages disposed concentrically in the heater base and a plurality of second passages connecting the plurality of first passages without being aligned in a direction towards a center of concentricity of the plurality of first passages,

wherein said heater base is configured to be cooled by feeding the gas having a temperature lower than a temperature of said heater base to the gas passage.

57. (Canceled)

58. (Previously Presented) The ceramic heater system according to claim 56, further comprising:

an electrode disposed in the heater base and located between the heater and the mounting surface; and

power supply means for applying a voltage by one of a direct current supply and high-frequency power supply to the electrode,

wherein an electrostatic chuck is configured to be formed when the voltage is applied to the electrode, the electrostatic chuck configured to at least one of electrostatically attract

and detach the object mounted on the heater base, and the electrostatic chuck and the heater form a one-body structure.

59. (Previously Presented) The ceramic heater system according to claim 56, wherein the gas passage has an internal surface area configured to provide a predetermined heating/cooling efficiency.

60. (Previously Presented) The ceramic heater system according to claim 56, wherein the gas passage comprises a heat-radiating fin disposed on a heater side and a roughened inner surface disposed on the heater side.

61. (Canceled)

62. (Previously Presented) The ceramic heater system according to claim 18, wherein the ceramic material comprises at least one of a nitride-based metallic material having a high melting point and an oxide-based metallic material having a high melting point.

63. (Previously Presented) The ceramic heater system according to claim 1, wherein the gas passage has an internal surface area configured to provide a predetermined heating/cooling efficiency.

64.-66. (Canceled)

67. (Previously Presented) The ceramic heater system according to claim 19, further comprising:

a gas supply source and a gas discharge line connected to the gas inlet and the gas outlets of the gas passage.

68.-74. (Canceled)

75. (Previously Presented) The ceramic heater system according to claim 9, wherein the high-melting-point metal comprises at least one of W, Mo and Pt.

76. (Previously Presented) The ceramic heater system according to claim 56, wherein the high-melting point metal comprises at least one of W, Mo, and Pt.